



COURSE OUTLINE

1. **Course:** BCEM 443, Metabolism - Fall 2021

Lecture 01: MWF 11:00 - 11:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Ian Lewis	ian.lewis2@ucalgary.ca	403 220-4366	BI 472	Tuesday and Wednesday 4:00-5:00 PM

COURSE DESCRIPTION:

In this course, we will learn about primary metabolism. This includes carbohydrate, lipid, amino acid, and nucleotide metabolism. We will also learn about how these pathways are regulated and how these pathways inform us about health, evolution and the molecular underpinnings of life.

Online Delivery Details:

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

ONLINE COURSE INFORMATION:

This course will run 100% online for the Fall 2021 semester via D2L and Zoom. All lecture and learning materials will be available to the student asynchronously within the D2L classroom to allow students the greatest flexibility in scheduling their work. Additionally, synchronous online class sessions will be run through Zoom on Monday, Wednesday and Fridays from 11-11:50 AM and once a week for each tutorial. These sessions are **optional to attend, with the exception of Dec. 8**, and will provide an opportunity to work through problem sets. Synchronous online sessions will be recorded and shared within the D2L classroom. Synchronous lecture and tutorial dates and times are listed in the course schedule.

TUTORIAL INFORMATION:

Tutorials will be held synchronously via Zoom. Attendance to the tutorials is **optional, with the exception of week 11**, but highly recommended. Sessions will be recorded and housed in D2L for students unable to attend. Please attend the tutorial section to which you have been assigned on the ucalgary course schedule. Read and watch tutorial material and prepare questions to ask your TA before coming to the live tutorial. TA office hours will be held on weeks without tutorials. Please refer to the Teaching Assistants tab in D2L for specific meeting times. If you have any questions regarding course-related material, please post your questions on the D2L Question/Answer Discussion forum

NAME & EMAIL CONTACT OF TEACHING ASSISTANTS:

Carly Chan (Lead teaching assistant) carly.chan@ucalgary.ca

Colin MacKenzie colin.mackenzie1@ucalgary.ca

Maryam Mapar maryam.mapar1@ucalgary.ca

Rajnigandha Pushpker rpushpke@ucalgary.ca

COMMUNICATION POLICY:

Please note that all course communications **must occur through your @ucalgary email or the D2L Question/Answer Discussion forum**. Teaching assistants and instructors will respond **within 48 hours except on weekends and holidays**.

Course Site:

D2L: BCEM 443 L01-(Fall 2021)-Metabolism

Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Chemistry 353 or 355; and Biochemistry 341 or 393.

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

GRADING:

(15%) Quizzes - 10 quizzes worth 1.5% each - See Tentative schedule at the end of the course outline

(30%) Tutorial assignments - 4 assignments worth 7.5% each -

(40%) Online test #1 - covers central carbon metabolism([Nov. 16-18](#))

(15%) Online test #2 - covers fatty acid metabolism([Dec. 8](#))

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	97 %	93 %	90 %	87%	83%	80 %	77 %	73%	70%	67 %	63 %

ASSESSMENT COMPONENTS: Course assessments will be divided into the two parts of the course, as noted in the course schedule.

- **Quizzes (15%):** Quizzes are designed to give you opportunities to practice and assess your understanding of the course material. Quizzes will be posted at the beginning of almost every week and must be completed in one week's time (11:59 PM on Mondays). Quizzes are automatically generated from a large test bank of questions. You may complete the quizzes as many times as you like to practice and review the course material. The highest score from all attempts will be used as your course grade.
- **Tutorial Assignments (30%):** Tutorial assignments are designed to test your problem-solving abilities and encourage team problem solving to work towards understanding more challenging concepts in biochemistry. While tutorial assignments can be completed in groups, all written work must be prepared and submitted individually. Work will be checked for plagiarism. The assignments will test on a combination of lecture and tutorial material. Assignments will be submitted as a single PDF file within D2L in the weeks they are scheduled. Complete details for the tutorial assignments are listed in D2L. Tutorial assignments are due by 11:59 PM every other Monday.
- **Online Tests (Total of 55%):** All online tests are synchronous one on one oral exams and will take place during scheduled class time. Students are required to have a microphone as stated in the *Learning Technologies and Requirements* section above. Tests are completed through D2L and Zoom.
 - **Online Test #1 (40%):** This test will assess the concepts you've learned throughout the central carbon metabolism section of the course, including lecture and tutorial content. Online test #1 will be an online oral exam and will take place during scheduled tutorial time on Week 11 in the class schedule.
 - **Online Test #2 (15%):** This test will assess the concepts you've learned throughout the course, including lecture and tutorial content. Online test #2 will be an online oral exam and will take place during scheduled lecture time on Dec. 8, 2021.

The University of Calgary offers a [flexible grade option](#), Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: <https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade>

4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of

the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

Missed work must be reported within 48 hours of the missed due date. Absences must be reported within 48 hours.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Required Textbook(s):

JOH L. TYMOCZKO JEREMY M BERG, LUBERT STRYER, *Biochemistry A short Course*: W H FREEMAN & COMPANY A MACMILLAN EDUCATION.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

7. **Examination Policy:**

All online tests are synchronous and will take place during scheduled class time. Students are required to have a webcam and microphone as stated in the *Learning Technologies and Requirements* section above. Tests are completed through D2L and Zoom.

Students should also read the Calendar, [Section G](#), on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

All written assignments (including, to a lesser extent, written exam responses) will be assessed at least partly on writing skills. Writing skills include not only surface correctness (grammar, punctuation, sentence structure, etc.) but also general clarity and organization. Sources used in research papers must be properly documented. If you need help with your writing, you may use the writing support services in the Learning Commons. For further information, please refer to the official online University of Calgary Calendar, Academic Regulations, E. Course Information, E.2: Writing Across the Curriculum: <http://www.ucalgary.ca/pubs/calendar/current/e-2.html>

10. Human & Living Organism Studies Statements:

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with [Section SC.4.1](#) of the University Calendar.

11. Reappraisal Of Grades:

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (syva@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-Violence-Policy.pdf>)
- d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)
 Student Academic Misconduct [Policy](#) and [Procedure](#)
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

e. Academic Accommodation Policy:

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the [Request for Academic Accommodation Form](#) and sending it to Lisa Gieg by email imgieg@ucalgary.ca preferably 10 business days before the due date of an assessment or scheduled absence.

f. Freedom of Information and Privacy: This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.

g. Student Union Information: [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.

h. Surveys: At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. Copyright of Course Materials: All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

Tentative Class Schedule

Week	Date	Lecture Description (MWF11-11:50am)	Assignment Due	Tutorials
Part 1: Central Carbon Metabolism taught by Dr. Lewis				
1	8-Sep	Course and metabolism introduction		No tutorials
	10-Sep	Organic chemistry and biochemistry review		
2	13-Sep	Glycolysis review	Quiz 1	Malaria drug screening
	15-Sep	Glycolysis mechanisms		
	17-Sep	Pentose Phosphate Pathway and malaria		
3	20-Sep	Glycogenesis/glycogenolysis	Quiz 2 Assignment 1	No tutorials TA Office hours
	22-Sep	TCA review		

	24-Sep	Glyoxylate shunt and ketogenic diet		
4	27-Sep	Metabolic regulation review	Quiz 3	LC-MS Metabolomics
	29-Sep	Diabetes		
	1-Oct	Flux introduction		
5	4-Oct	Flux balance analysis	Quiz 4	<i>No tutorials</i> TA Office hours
			Assignment 2	
	6-Oct	Flux balance analysis		
	8-Oct	Microbial metabolism (guest)		
6	11-Oct	<i>Thanksgiving (no lecture)</i>		FBA analysis
	13-Oct	Amino acid anabolism	Quiz 5	
	15-Oct	Amino acid catabolism and Urea cycle		
7	18-Oct	Nitrogen-related topics	Quiz 6	<i>No tutorials</i> TA Office hours
			Assignment 3	
	20-Oct	Growth laws		
	22-Oct	Nutritional supplements		
8	25-Oct	Purine biosynthesis	Quiz 7	Isotope Tracing
	27-Oct	Pyrimidine biosynthesis		
	29-Oct	Cancer metabolism		
9	1-Nov	Plant metabolism	Quiz 8	<i>No tutorials</i> TA Office hours
			Assignment 4	
	3-Nov	Mind-altering substances		
	5-Nov	Review		
10	8-Nov	<i>Reading week (no lecture)</i>		<i>No tutorials</i>
Part 2: Fatty Acid Metabolism taught by Dr. Noschang				
11	15-Nov	Lipids introduction		Online test #1
	17-Nov	Biophysical properties of lipids		
	19-Nov	FA synthesis		
12	22-Nov	FA synthesis/oxidation	Quiz 9	<i>No tutorials</i> TA Office hours
	24-Nov	FA oxidation		
	26-Nov	Glycerolipids		
13	29-Nov	Neutral lipid (taught by Dr. Lewis)	Quiz 10	Covid lipid project
	1-Dec	Lipid signalling (taught by Dr. Lewis)		
	3-Dec	Sphingolipids (taught by Dr. Lewis)		
14	6-Dec	Sterols (taught by Dr. Lewis)		<i>No tutorials</i> TA Office hours
	8-Dec	Online test #2		

Exam period	TBA	Final exam scheduled by the Registrar		
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Course Outcomes:

- Analyze and rationalize cellular strategies for maintenance of carbon, nitrogen and lipid homeostasis
- Understand the common reaction mechanisms used in central carbon metabolism.
- Diagram the flow of carbon through glycolysis, pentose phosphate pathway, glycogen, tricarboxylic acid cycle, and related pathways.
- Understand metabolic flux and be able to use flux balance analysis to describe metabolic steady state.
- Identify critical metabolic steps where crosstalk between different metabolic pathways occurs
- Understand basic regulatory mechanisms that maintain homeostasis
- Recognize that alterations of cellular homeostasis lead to metabolic diseases and appreciate how this is studied using modern approaches.
- Know how to interpret data, how to label scientific figures and tables, and how to write a lab report.

Electronically Approved - Sep 08 2021 15:48

Department Approval

Electronically Approved - Sep 14 2021 08:47

Associate Dean's Approval